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PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) IMPROVEMENTS IN OR RELATING TO THE BRAZING
 OF ALUMINIUM OR ALUMINIUM ALLOY PIPES TO
 ALUMINIUM OR ALUMINIUM ALLOY TANKS

(71) We, SOCIETE ANONYME DES USINES CHAUSSON, a joint Stock French Company, of 35, rue Malakoff, Asnieres, Hauts-de-Seine, France, do hereby declare the invention for which we pray that a Patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:—

10 The present invention relates to the brazing of aluminium or aluminium alloy pipes to aluminium or aluminium alloy tanks.

15 According to the present invention, there is provided a method of brazing an aluminium or aluminium alloy pipe to an aluminium or aluminium alloy tank in the manufacture for example of radiators, including the steps of forming an annular projection externally around the pipe at a position leaving the end portion of the pipe free for insertion in a hole provided in a wall of the tank, inserting the free end portion of the pipe in the tank hole so that the annular projection contacts the tank wall and defines therewith a capillary space, maintaining the pipe annular projection and tank wall in contact substantially without any elastic deformation of the pipe or tank, and heating and cooling the tank wall and inserted pipe, whilst the latter are maintained in contact as aforesaid, so that brazing alloy provided enters the capillary space and brazes the pipe annular projection fluid-tightly to the tank wall.

20 25 30 35 According to another feature of the invention there is provided an aluminium or aluminium alloy tank in combination with an aluminium or aluminium alloy pipe such as for example in a radiator, wherein the pipe has near one end thereof an annular external projection therearound, and the tank has a hole in one wall in which a portion of said one end of the pipe is located with the pipe annular projection fluid-tightly brazed to the tank wall.

40 45 For a better understanding of the present invention and to show how the same may be carried into effect, reference will now be made,

by way of example to the accompanying drawing, in which:—

Figure 1 is a partial sectional view of a pipe brazed to a tank such as a radiator tank, according to the invention,

Figure 2 is a sectional elevation view, analogous to Figure 1 but showing another embodiment of the invention, and

Figures 3 and 4 are partial plan views seen from below and according to line III—III of Figure 2, illustrating two particular embodiments.

According to the invention, to ensure the connection of a pipe 1 to a tank 2 such as a radiator tank in the manufacture for example of radiators, said pipe and tank being both made of aluminium or aluminium alloy, the pipe 1 is provided with a free end portion 3 of a diameter corresponding to an opening 4 provided in a wall of the tank 2 for receiving said pipe as shown in Figure 1. The end portion 3 acts as a guide and centering element by means of which the pipe is engaged in the opening 4. Near the end portion 3, the pipe is formed with an annular projection 5 externally therearound and formed for example by rolling or hammering of the pipe. This projection 5 contacts the tank 2, when the pipe portion 3 is entered in the tank hole, with a relatively small contact area and defines a capillary space with the tank wall.

For ensuring the connection between the pipe 1 and the tank 2, the pipe is arranged so that the projection 5 is maintained in contact along the periphery thereof with the wall of the tank substantially without any elastic deformation of the tank or pipe which means that the bearing pressure of the projection 5 on the tank wall is such that at the moment when the pipe and the tank are heated to brazing temperature, there is no flexion or bending of the tank wall nor any extrusion of the tank wall metal. The tank wall and inserted pipe 1 are then heated to the melting point temperature of brazing alloy provided and cooled, whilst the tank wall and inserted pipe are

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5 maintained in contact substantially without elastic deformation of the pipe or tank, so that the brazing alloy enters the capillary space and brazes the projection 5 fluid-tightly to the tank wall.

10 The nature of the brazing alloy as well as the means employed to effect brazing are as conventionally known and hence will not be described in detail. As an example, however, the upper wall of the tank 2, as well as the external surface of the pipe 1 may be covered by a brazing alloy such as aluminium-silicon in the form of a coating or contained in a flux, or in the form of a ring. The heating 15 is effected either by dipping or plunging the assembly of the tank and pipe, whilst the latter are maintained in contact as aforesaid, in a flux bath, or by placing the tank and pipe assembly in an oven after a flux has been deposited thereon in any convenient way.

20 As contact is maintained during the brazing operation between the tank and the pipe projection 5, the finally obtained brazed joint is fluid-tight.

25 To maintain close contact without elastic pressure between the pipe projection and the tank is possible in various ways. In the case of a radiator having fins or spacers and collectors which must also be brazed to the pipe and/or tank it is possible to use a mounting or jig in which the pipe, tank and other parts of the radiator are held together in contact substantially without elastic deformation. This mounting is applicable to the arrangement 30 shown in Figure 1 and such a mounting ensures that the pressure between the pipe projection 5 and the tank wall at the moment of brazing is an applied static pressure and not a pressure produced by elastic deformation.

35 Thus when heating the parts to be brazed and the mounting, during the brazing operation the pressure initially produced by said mounting becomes null and practically null at the moment of brazing since the aluminium or aluminium alloy parts lose their elasticity as the temperature increases and it was this elasticity which was in fact giving rise to the initial static pressure exerted on said parts by 40 the mounting.

45 If, however a mounting or jig is not employed for maintaining the pipe projection and the tank in contact, then it is possible to proceed as shown in Figures 2 to 4. As shown in Figures 2 and 3 the end portion 3 of the pipe inserted in the hole in the tank 2 is peripherally deformed as shown by the reference numeral 6 to grip the inside surface of the tank around the hole before the tank and pipe 50 assembly is submitted to the brazing operation and in this way the pipe projection and tank are maintained in contact. In the brazing operation the pipe projection 5 is brazed to the outer surface of the tank, and the deformed 55 part 6 is brazed to the inside surface of the

tank, so that the connection of the pipe to the tank is fluid-tight.

55 If however it is difficult to bend the pipe end portion 3 along its fully periphery as shown in Figures 2 and 3, particularly when it is difficult to engage a bending tool thereon, it is alternatively possible, as shown in Figure 4, to provide at least two lugs 7 on the pipe end portion 3 which are bent over against the inside surface of the tank to maintain the projection 5 in contact with the outer wall of the tank 2 during the heating and cooling stages of the brazing operation.

WHAT WE CLAIM IS:—

60 1. A method of brazing an aluminium or aluminium alloy pipe to an aluminium or aluminium alloy tank in the manufacture for example of radiators, including the steps of forming an annular projection externally around the pipe at a position leaving an end portion of the pipe free for insertion in a hole provided in a wall of the tank, inserting the free end portion of the pipe in the tank hole so that the annular projection contacts the tank wall and defines therewith a capillary space, maintaining the pipe annular projection and tank wall in contact substantially without any elastic deformation of the pipe or tank, and heating and cooling the tank wall and inserted pipe, while the latter are maintained in contact as aforesaid, so that brazing alloy provided enters the capillary space and brazes the pipe annular projection fluid-tightly to the tank wall.

65 2. A method according to claim 1 in which the pipe annular projection and tank wall are maintained in contact as aforesaid by causing part of the free end portion of the pipe to engage the side of the tank wall opposite to the side of the tank wall contacted by said pipe annular projection.

70 3. An aluminium or aluminium alloy tank in combination with an aluminium or aluminium alloy pipe such as for example in a radiator, wherein the pipe has near one end thereof an annular external projection therearound and the tank has a hole in one wall in which a portion of said one end of the pipe is located with the pipe annular projection fluid-tightly brazed to the tank wall.

75 4. The combination according to claim 3 wherein said one end of the pipe has at least two lugs engaging the side of the tank wall opposite to the side of the tank wall to which the pipe annular projection is brazed.

80 5. The combination according to claim 3 wherein said one end of the pipe is peripherally deformed against the side of the tank wall opposite to the side of the tank wall to which the pipe annular projection is brazed.

85 6. A method of brazing an aluminium or aluminium alloy pipe to an aluminium or aluminium alloy tank in the manufacture for example of radiators, substantially as herein-

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before described with reference to the accompanying drawing.

7. An aluminium or aluminium alloy tank in combination with an aluminium or aluminium alloy pipe such as for example in a radiator, substantially as hereinbefore described and as shown in Figure 1, Figures 2 and 3 or Figure 4 of the accompanying drawing.

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FIG.1.

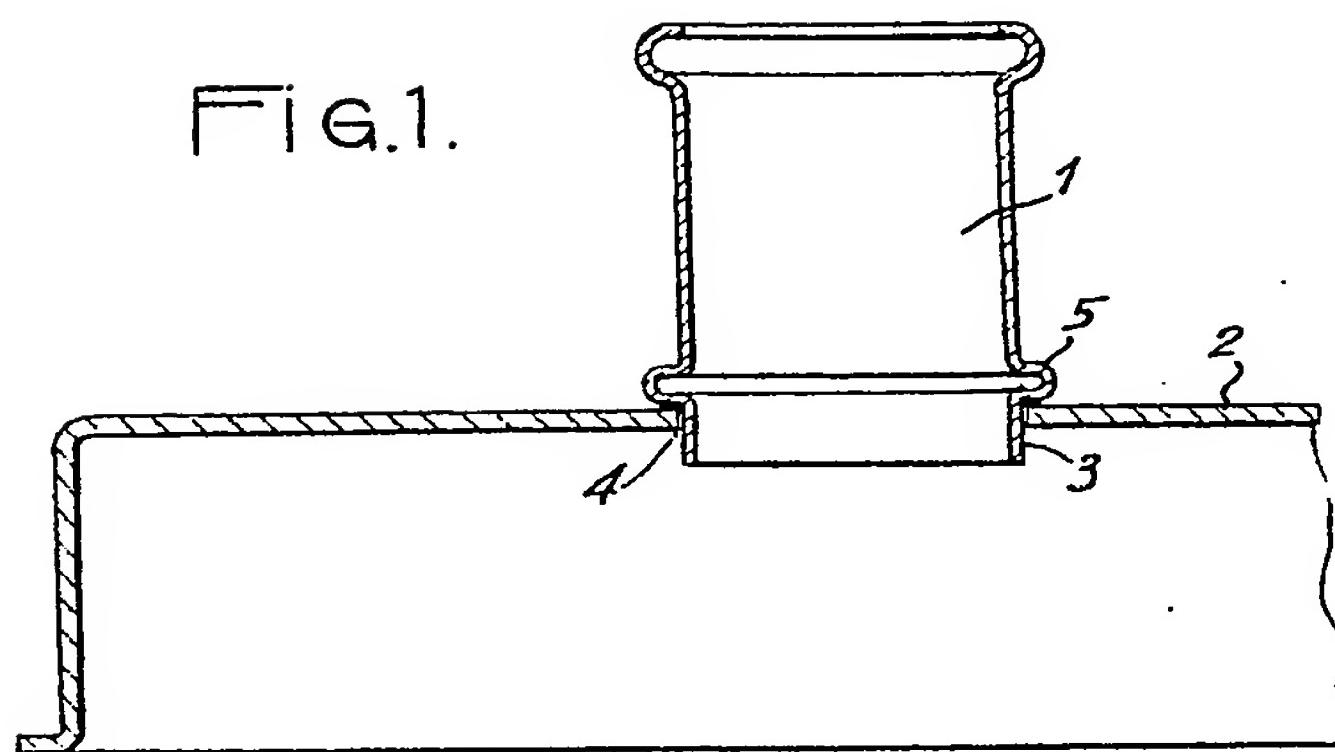


FIG.2.

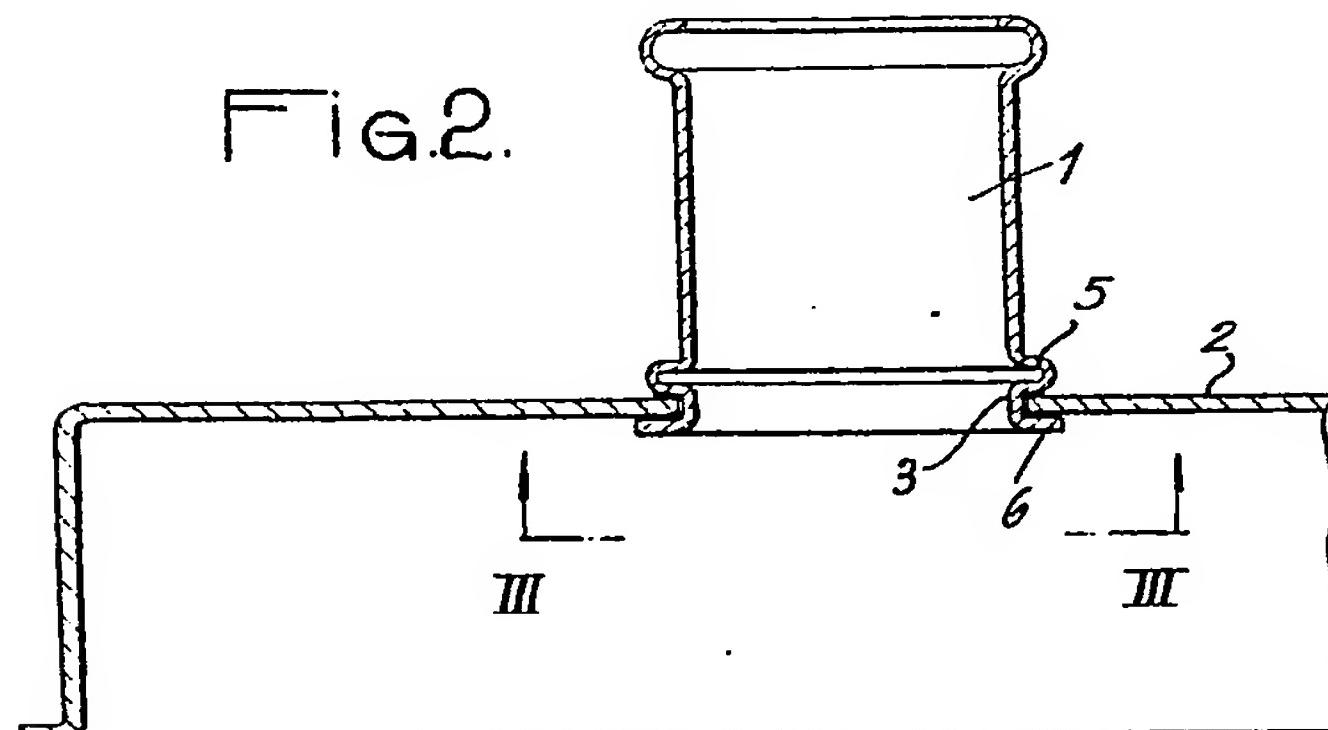


FIG.3.

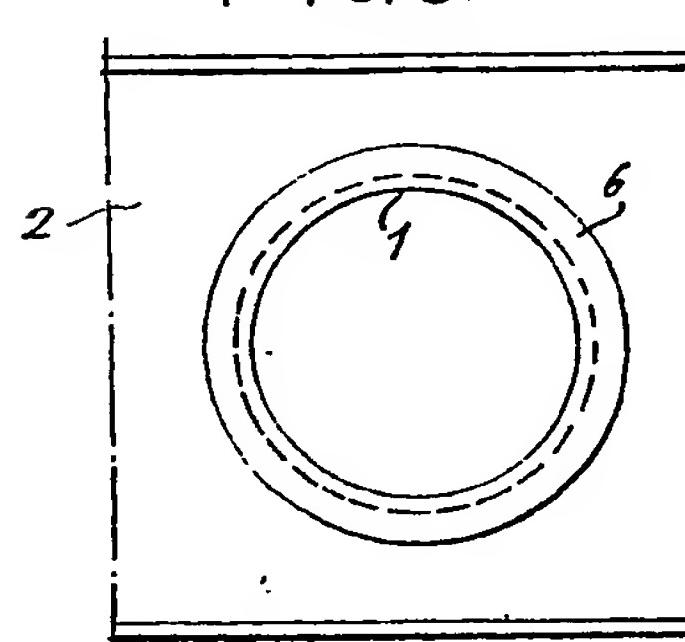


FIG.4.

